

Appendix I

Guide Specification for Code Phase Differential NAVSTAR Global Positioning System (GPS) Survey Receivers and Related Equipment/ Instrumentation

INSTRUCTIONS

I-1. General

This guide specification supersedes the USACE guide CW-01334.3, 21 June 1991, "Procurement of a Real-Time Differential Global Positioning System (DGPS)". This guide specification is intended for use in preparation and review of specifications for a real-time differential global positioning system (DGPS), generally for use on hydrographic survey vessels and dredges. However, the system may be used for many other applications. The DGPS positions may be computed in real time with the use of the proper data links or, if desired, it may be post-mission processed to generate positions. This guide includes the technical requirements needed to develop formally advertised specifications.

I-2. Applicability

This guide applies to DGPS survey systems providing an expected accuracy of 1 to 6 m (2drms). Typical applications encompass positioning hydrographic survey vessels and dredges in support of Civil Works river and harbor construction. Applications may include any number of activities requiring real-time positioning of moving platforms at the stated accuracy level. The DGPS system specified measures the broadcast code phase to develop pseudo range corrections at a shore-based reference station. (This may be a reference station installed by the USACE, the U.S. Coast Guard, or some other "differential data provider", if the appropriate standard message format is used.) The reference station corrections are subsequently transmitted to the mobile user via a communications link, where the mobile user computes a corrected position based on the mobile GPS data and the received pseudo range corrections. This guide is not intended to support GPS carrier-phase measuring systems that provide centimeter-level accuracies. Refer to Appendix H for differential carrier-based equipment to support higher accuracy applications.

I-3. Coverage

This guide follows the Uniform Contract Format for supply solicitations, as outlined in Part 14.201 of the Federal Acquisition Regulations (FAR).

a. This guide may be used for either direct bid solicitations or proposal request solicitations, depending on the complexity of the required system. Evaluation factors (Part IV, Section M) are provided for contracts involving a technical review of proposals. The use of a technical review is optional.

b. A sample "Supplies of Services and Prices" schedule is included in this guide for insertion in Part I, Section B of the contract. Technical performance requirements for a DGPS survey system are in Part I, Section C (Description/ Specifications). Other contract sections that require clauses specific to DGPS equipment are noted. Nontechnical supply contract clauses/provisions, which are incorporated in Parts I, II, III, and IV of the procurement specifications, should be developed by each respective Field Operating Activity (FOA) using appropriate FAR and supplemental guidance.

c. Continuing developments in DGPS survey instrumentation and techniques mandate that these guide specifications be continuously evaluated by USACE commands to ensure they are technologically current.

I-4. References

The specification author must be thoroughly familiar with the basic GPS functions (e.g., determining the optimum number and technical characteristics of GPS receivers, and auxiliary support equipment and instrumentation) to define the technical requirement options contained in this guide. Additional guidance is found in the HQUSACE POLICY MEMORANDUM, Subject: "Acquisition and Use of Differential Global Positioning System (DGPS) Equipment for USACE Activities," dated 27 January 1994, and topical information on DGPS is contained in EM 1110-2-1003 (Hydrographic Surveying).

I-5. DGPS System Requirements

This guide may be used to procure a complete DGPS real-time survey system. This includes reference station GPS receiver and processor unit, remote (vessel) station GPS receiver and processor unit, a communication link, and onsite training. If GPS receivers are being added to an existing system or suite of equipment, then only the first item would be required in the solicitation, with other items deleted as necessary. Also note that, in general, mixing receivers from different manufacturers may not work with all techniques and software.

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I-6. Alternate Clauses/Provisions or Options

Alternate clauses/provisions throughout this guide specification are indicated by a single asterisk. This asterisk signifies that provisions that are not applicable to the particular procurement should be deleted. Clauses requiring the insertion of descriptive material are indicated by an asterisk and in brackets (e.g., *[]). When a choice of items exists, they are normally contained in successive brackets.

I-7. Notes and Comments

General comments and instructions used in this guide are contained within asterisk blocks and highlighted in bold type. These blocked comments and instructions should be removed from the final contract.

I-8. Submittal For Review and Approval

If specifications for NAVSTAR GPS survey systems are required to be submitted to higher authority for review and approval, they shall include printed copies of this guide specification, as revised for the particular procurement action. Guidance on review requirements for GPS systems is contained in the HQUSACE POLICY MEMORANDUM, Subject: "Acquisition and Use of Differential Global Positioning System (DGPS) Equipment for USACE Activities", dated 27 January 1994.

Part I - The Contract Schedule

Section A

Solicitation/Contract Form

**NOTE: Include here Standard Form 33 (Solicitation, Offer and Award) or
Standard Form 26 (Award/Contract), as applicable.**

Section B

Supplies or Services and Prices/Costs

**NOTE: The sample below represents a typical schedule for procurement of GPS
instrumentation and related equipment. This schedule must be tailored based on
the specific technical requirements outlined in Section C of the contract.**

Supplies/Services and Prices

<u>Item No.</u>	<u>Description</u>	<u>Quantity</u>	<u>U/M</u>	<u>U/P</u>	<u>Amt</u>
0001	Real-time DGPS survey system, related equipment, software, data link, and other components, in accordance with the technical specifications found in Section C.	*[____]	EA	___	___
***** Add for RFP evaluation or if necessary ***** * [Evaluation will be made on the basis of the technical data under the guidelines found in Section M. Failure to show compliance with the specifications will require rejection of the bid.] ***** NOTE: The following items are included as separate components if the solicitation is to upgrade or add to existing GPS equipment. *****					
0002	*[Micro-computer system, as specified in Section C.]	___	___	___	___

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Item No.	Description	Quantity	U/M	U/P	Amt
0003	* [DGPS post processing and planning, software as specified in Section C.]	—	—	—	—
0004	* [Data link for real-time applications, as specified in Section C.]	—	—	—	—
0005	* [DGPS receiver system, data link, and software training.]	—	—	—	—

NOTE: Add other items to the schedule as necessary. These may include spare batteries, data storage devices, communication/modem devices, software/hardware for navigation (e.g., survey vessel positioning and guidance control). Hardware/software interface requirements to existing survey systems (e.g., hydrographic systems) may also be separately scheduled.

Section C

Description/Specifications

C.1. General DGPS System Description. The DGPS system to be procured under this solicitation is intended for use in real-time positioning applications using the GPS code phase as the principle observable. The system will yield positions of a "rover" station to an accuracy of *[6 m, 2 DRMS, or better on baselines up to 300 km with respect to a stationary reference station.] *[The system procured under this solicitation will interface to, and operate with, *[the hydrographic surveying package] *[_____]*[and]*[or]*[the electronic display and information system]*[_____].]

C.1.1. General DGPS System Components. Each real-time GPS-based positioning system shall possess at least the following major components:

- (1) Integrated GPS receiver/data link receiver-transmitter (referred to as the "DGPS receiver").
- (2) Integrated GPS/data link antenna.
- (3) Supporting software.
- (4) DGPS receiver controller.

C.2. Receiver Requirements. Unless otherwise specified, the performance requirements given below, shall be met by the GPS receivers in conjunction with the antenna assembly and antenna cable.

C.2.1. GPS Signal Levels. GPS receivers delivered shall acquire and track GPS signals and otherwise perform as specified herein, when the signal levels from GPS satellites incident at the antenna are within the range of minimum to maximum levels specified in ICD-GPS-200 REV. B-PR.

C.2.2. Cryptographic Keys. GPS receivers shall perform as specified herein without requiring cryptographic keys, whether or not GPS selective availability (SA) and/or anti-spoofing (AS) are activated.

C.2.3. Code Accuracy. The receiver shall have an 11 C/A-code phase measurement accuracy of 30 cm (RMS) or better, exclusive of receiver clock time and frequency offsets. Signal measurements (observables) shall be time tagged with the time of receipt of the signal, referenced to the receiver clock. Time tags shall have a resolution of 1 μ sec or better. Time tags shall be within 1 msec with respect to GPS time.

C.2.4. Receiver Output. The GPS receiver shall be able to output the GPS observables as described in C.2.3. with a latency of less than 1 sec. The GPS receivers shall be able to output the information from the full GPS navigation message, as specified in ICD-GPS-200 REV. B-PR. This shall include ephemeris data, almanac data, ionospheric parameters and coordinated universal time (UTC) parameters. The UTC and ephemeris data shall be available by request or if a change has occurred in those parameters.

C.2.5. Receiver Data Rate. The GPS observable data described above shall be available at a minimum of a 1 Hz rate.

C.2.6. 1 Pulse Per Second (PPS) output. GPS receivers delivered shall have a 1 PPS time strobe and its associated time tag. The 1 PPS pulse and time tag shall be accessible through a port (or ports) on the GPS receiver so that external system components can be time synchronized to UTC time.

C.2.7. Internal Receiver Testing. The receiver shall perform self tests and checks to detect electronic malfunctions and/or faulty data collection, including cycle slips. The receiver shall provide immediate *[audio] *[visual] notification of failures. The receiver shall perform any needed calibrations automatically.

C.2.8. Reinitialization. The receiver shall be capable of reinitializing itself and resume normal operation after a power interruption without operator assistance. The data collected by the GPS receiver shall not be lost due to power interruption but stored in the receiver or other archiving media.

C.2.9. Multiple Satellite Tracking. The DGPS receiver shall be capable of simultaneously and continuously tracking a minimum of six satellites and shall simultaneously and continuously receive and decode the GPS navigation message from each satellite.

C.2.10. Operating Conditions. The GPS receivers, *[including its antenna,] delivered shall meet the following criteria:

(1) Successfully acquire and track unobstructed GPS satellites, visible 5 deg and higher above the horizon, in all weather conditions.

(2) Operate at humidity ranges of 0 to 100 percent.

(3) Operate within the temperature range of -20 °C to +50 °C.

*[(4) Be waterproof and able to operate in an ocean environment aboard open survey launches.]

*[(5) Operate in heavy rain (2 in./day).]

*[(6) Operate in fog.]

*[(7) Operate in and resist corrosion in salty air conditions.]

*[(8) Operate in snow.]

C.2.11. Receiver Power Requirements. The GPS receivers delivered shall:

(1) Be self protecting from power surges, spikes, and reverse polarity.

(2) Allow the operator to switch power sources (AC, DC, or battery) while maintaining receiver operation and without loss of stored data.

(3) Provide a *[visual] *[audible] warning for low power.

(4) Be capable of operating using *[a battery pack] *[and] *[or] *[110-v AC power] *[and] *[or] *[12-v DC power] *[24-v DC power] *[external DC power].

*(5). The battery pack shall meet the following criteria:]

*(a) Contain rechargeable battery/batteries that can operate the receiver for at least 3.5 hr on a single (re)charge.;

*(b) Be *[either] *[internal] *[or] *[external] to the receiver.;

*(c) Include all cables, hardware, etc., necessary to connect/install the battery pack. The batteries shall be water and dust tight and protected from damage and inadvertent shorting of the terminals.]

*((6). For operation using *[AC] *[and] *[external DC] *[power].

*(a) When operating under *[AC] *[or] *[DC] power, the unit shall be capable of simultaneously charging the battery pack. The battery pack shall power the receiver if the normal power supply is interrupted.]

*(b) The AC power supply *[shall be internal] *[may be internal or external] to the receiver.]

*(c) The power supply/battery charger shall provide all voltages necessary to operate the receiver and (re)charge the battery pack.]

*(d) The power supply/battery charger shall be designed to automatically protect the battery pack from overcharging.]

*(e) All cables and connectors needed to connect the power supply/battery charger to the power line *[and receiver] shall be included.]

*(f) The AC power supply/battery charger shall operate from *[115-v] *[and 230-v] AC (± 10 percent) *[50/] 60 Hz, single phase power.]

*(g) The unit shall operate from external *[12-v DC] *[24-v DC] *[9- to 32-v DC] power.]

NOTE: Not all manufacturers provide a battery that is internal to the receiver. Moving the battery pack external to the receiver does not affect the functioning; it is a matter of design. For example, moving the battery pack external to the receiver could substantially decrease the size of the unit. The FOA is encouraged to define their requirements and proceed accordingly.

C.2.12. Manuals. At least two sets of complete operation and maintenance manuals shall be included with each receiver and shall cover all auxiliary components furnished with each receiver. *[Updates shall be furnished as they become available.]

C.2.13. Field Planning. The receiver shall have internal software that, as a minimum, is capable of computing the availability and positions of satellites for any given time and the current position of the GPS receiver using data gathered by the GPS receiver.

C.2.14. Dimensions. The DGPS receiver shall have no single dimension exceeding *[] cm.

*[C.2.15. Weight. The receiver shall be transportable by one person. [One complete field station consisting of receiver, battery pack, antenna, and antenna cable shall not exceed *[] kg ([] lbs).]

C.2.16. Data Format. The roving station receiver shall accept and apply correction data in radio technical commission for maritime services special committee 104 (RTCM SC-104), format version 2.1 and the U.S. Coast Guard Broadcast Standards. *[The reference station receiver shall generate pseudo range corrections for each satellite and transmit the corrections in the RTCM format, to be used by the roving station.]

C.2.17. Accuracy. Real-time positioning accuracy relative to the reference station shall be *[2]*[6] m *[2] sigma, or better, within a range of at least 300 km from the reference station.

C.2.18. Position Rate. The receiver shall be capable of providing output position fixes at rates within the range of [] Hz to [] Hz.

C.2.19. Velocity. The receiver shall be capable of determining *[velocity and] position while moving at speeds of up to *[] knots.]

C.2.20. GPS Antenna Assembly.

(1) Antenna Mount. The GPS antenna shall be capable of being mounted on a standard surveyor's tripod with a 5/8 in. by 11-in. threaded stud *[or to a standard wild type tribrach].

(2) Receiver/Antenna Separation. The system shall allow the antenna to be located at least *[30] *[] m from the receiver such that it can be operated remotely from the receiver with no system degradation.

(3) Antenna Cables. *[One] *[] antenna cable(s) shall be furnished with each receiver. *[[One] *[each] of these cables should be at least *[] m,] * [and the other cable should be at least *[] m.] All appropriate connectors should already be attached to the cable ends. *[These cables shall be capable of being cascaded for a total length of *[] m of cable for setup flexibility.]

*[(4). Antenna Assembly. The antenna assembly shall include the following criteria:

*[(a) A method to minimize ice and snow buildup.

*[(b) A method to reduce bird nesting capability.]

*[(c) The ability to withstand strong winds up to *[] knots.]

*[(d) A method to orient (to north) after mounting.]

*[(e) A mechanical mark for height measurement with a known offset from the phase center.]]

*[(7) Be 100 percent sealed/watertight. *[One] *[____] GPS antenna shall be provided with each GPS receiver unit.]

*[(8). Antenna Pole. An antenna pole shall be provided for use during survey operations. It shall be *[a fixed- height pole of 2 m] *[extendable from a length of 1 m (± 0.2 m) to 2 m (with a variance of ± 0.5 m)] and shall allow rapid attachment and detachment of the GPS survey antenna. The pole shall include a built-in leveling device and legs that are *[collapsible and attached] *[detachable].]

*[(9) Tribrach. A standard tribrach (with adapters) shall be provided with each antenna. The tribrach shall allow the antenna to be mounted atop the tribrach. The tribrach shall be able to be mounted on top of a standard surveyor's tripod with a 5/8-in. threaded stud and shall include adapters to allow mounting of standard target sets.]

*[(10) Vehicular Antenna Mount. A survey antenna mount that can easily be attached or detached from the vehicle shall be provided. This mount shall be designed so that it remains firmly in place at speeds of up to 88.5 kmph (55 mph) on a level roadway. The mount shall be designed so that its use does not require vehicle modification.]

C.2.21. Input and Output Ports.

(1) Standards. *[All I/O ports will be compatible with the RS-232 standard.] *[I/O ports shall be compatible with any remote station processor, data terminal or storage devices used in the positioning system.] *[The vendor shall provide complete documentation of the I/O ports including connectors, signal descriptors, connector pin outs, communications protocols, command and message descriptions, required to set up the receiver and extract and decode the observed data.]

NOTE: The following option, C.2.21.(2), would be used for differential code position interface to marine systems such as electronic charts or hydrographic survey systems.

*[(2) Real-time positional data out of the remote receiver will adhere to the National Maritime Electronics Association (NMEA) 0183 data sentences format and will be output over an RS-232 compatible port.]

C.3. Data Link for Real-Time Applications.

C.3.1. The data link shall be completely functionally integrated with the receivers and processors procured under this solicitation. This includes the incorporation of modems for the complete interface of radio to processor/receiver.

C.3.2. The data link shall provide data from the reference station to the "roving" station to allow the system to compute positions of the roving station using a pseudo range correction processing technique at a rate of at least one position per second, with no more than 1 percent loss of position data. The processing technique shall not be a function of the data link used. The data link shall transmit RTCM special committee 104 v2.1, as specified in Paragraph C.2. of this solicitation, to the other receiver used in the DGPS system. *[The data link equipment shall be identical at both stations to allow transmission from the "roving" station to the reference station.]

NOTE: There are several alternatives for the selection of a data link for the transmission of

pseudo-range corrections. Commercial service providers also charge a prescription and/or monthly fee for the corrections.

C.3.3. *[The data link system shall operate at the *[VHF frequency of ____]*[VHF frequencies of ____] and transmit power of *[____] w.]. *[The data link shall operate at a frequency and transmit power that does not require licensure for use.] *[The data link shall utilize a commercially available pseudo-range broadcast that follows the criteria found elsewhere in Section C of this specification. The proposal will include a fee schedule for prescription and monthly service.] *[The data link shall be capable of operation at a minimum of 9,600 baud, be minimum shift keying (MSK) demodulation, have a selectable bit rate between 100 and 200 BPS, be able to receive and select desired USCG Radiobeacon Signals in the range of 283.5 to 325.0 kHz, and operate in conditions similar to the GPS receiver specified in Section C.2.10.]

NOTE: The frequency used for a VHF broadcast must be coordinated with the FOA frequency manager. Modulation rates and/or channel bandwidth requirements also may have to be specified. The unlicensed frequency will also be low power, hence, very short range.

*[C.3.4. The data link shall have an omnidirectional broadcast range of *[8]*[16]*[24]*[32]*[40] km (*[5]*[10]*[15]*[20]*[25] miles) and maintain the positioning capability stated in Paragraph C.10.2.]

*[C.3.5. A mounting kit shall be included to mount the data link antenna to a mast or range pole.]

*[C.3.6. The data link antenna shall be *[suitable for installation on small hydrographic survey launches (less than 7 m)] *[and]*[have an antenna cable of at least *[____] m (____ ft)].

*[C.3.7. Power Supply. The data link (including modem) shall operate on a *[standard 110-v AC power source]*[and]*[or]*[unregulated 12-v DC power source].]

*[C.3.8. Integrated GPS/Data Link Antenna Assembly. A combined GPS and data link antenna is desired.]

*[C.3.9. Receiver/Antenna Separation. The system, at the roving station, shall allow the antenna to be located at least 22.86 m (75 ft) from the receiver so that it can be operated remotely from the receiver with no system degradation.]

*[C.3.10. Antenna Cables. Two antenna cable(s) shall be furnished with each receiver. One of these cables should be at least 7.62 m (25 ft), and the other cable should be at least 15.24 m (50 ft). All appropriate connectors should already be attached to the cable ends. These cables shall be capable of being cascaded for a total length of 22.86 m (75 ft) of cable for setup flexibility.]

*[C.3.11. Integrated Antenna Mounting. A standard marine mount shall be provided for the integrated antenna to be mounted on top of a survey vessel.]

*[C.3.12. Antenna Assembly. The antenna assembly shall include the following criteria:

- (1) A method to minimize ice and snow buildup.
- (2) [A method to reduce bird roosting capability.]
- (3) The ability to withstand strong winds up to *[100 knots.]

(4) Operation within the temperature range of -40 °C to +65 °C.]

*[C.3.13. Tribrach. A standard tribrach (with adapters) shall be provided with each antenna. The tribrach shall allow the antenna to be mounted atop the tribrach. The tribrach shall be able to be mounted on top of a standard surveyor's tripod with a 5/8-in. threaded stud and shall include adapters to allow the mounting of standard target sets.]

*[C.3.14. Vehicular Antenna Mount. A survey antenna mount shall be provided that can easily be attached or detached from the vehicle. This mount shall be designed so that it remains firmly in place at speeds of up to 88.5 kmph (55 mph) on a level roadway. The mount shall be designed so that its use does not require vehicle modification.]

*[C.4. Receiver Controller.]

*[C.4.1. A receiver controller shall be provided to allow DGPS receiver controls and settings to be modified or changed by the user. This controller may be integral to the GPS receiver and should have the following requirements:]

*[(1) Be capable of running the disk operating system (DOS) 5.0, or later, release date.]

*[(2) Have a minimum of a 486-dx (or equivalent processor) (which has the required math co-processor).]

*[(3) Have a clock speed of at least 66 mHz.]

*[(4) Have a minimum of 200 megabytes (mb) of hard drive, with 20 msec access speed or faster.]

*[(5) Have a minimum of 8 mb random access memory.]

*[(6) Have a minimum of 1 high density 3.5-in. disk drive.]

*[(7) Have a VGA graphics adapter.]

*[(8) Have a minimum of one parallel port and two serial ports.]

*[(9) Have an external monitor port that allows both internal and external monitor display simultaneously.]

*[(10) Be notebook computers.]

*[(11) Have an expansion port or module.]

*[C.4.2. Power. The controller must be able to operate from the same power sources as the receiver.]

*[C.4.3. Environment. The controller must be able to work in the same environment as the DGPS receiver.]

C.5. Software

C.5.1. All software must be provided to change setting and/or configure the GPS receivers.

C.5.2. All software must run on the platform as stated in Section C.4.

C.5.3. The software will allow the GPS differential code phase positions to be computed in a post mission processing mode.

C.5.4. Updates. All post-processing software updates shall be provided for a period of 4 years from the date of delivery.

C.6. Training.

C.6.1. Upon delivery, the vendor shall provide training of at least *[1] day at *[location] *[to *[4] persons] on the operation of all software and hardware delivered as part of this contract.

*[C.6.2. At a future date, determined by the contracting officer based on coordination with the vendor, and not exceeding 6 months after delivery, the vendor will give an additional *[1] day training at *[location].]

C.7. Miscellaneous Requirements.

C.7.1. All power cables, computer cables, and any other item not mentioned in these specifications needed to make this equipment fully operable shall be furnished as part of this contract.

*[C.7.2. Rugged shipping containers shall be furnished for all hardware delivered under this solicitation.]

*[C.7.3. Survey Planning. Survey planning software shall be provided that, as a minimum, includes the following: tabular and graphic SV rise/set times, elevations, and azimuths for user specified geographic locations and times; sky plots of satellite positions with provisions for plotting satellite obstructions on the screen; listing of GDOP, PDOP, HDOP, and VDOP; selection of specific satellite constellations to support in-depth kinematic survey planning; and selection of multiple satellite obstructions.

C.7.4. All hardware and software updates will be offered to the Government for a period of 1 year from the date of delivery, free of charge or delivery cost, or at a set rate as specified by the contract. The Government may, at its option, accept or reject the offered updates. The vendor shall support repair and maintenance of the Government owned configurations of hardware, firmware, and software for a minimum of 5 years after delivery.

*[C.7.5. The vendor shall provide repair and maintenance of all hardware delivered under this solicitation for a period of *[_] (--) years, free of charge.]

NOTE: At this point, other unique items may be added to the requirements if called for and/or requiring specification in Section B.

Any specific vessel installation requirements for receivers, data links, or antenna should be added. As-built vessel drawings or installation sketches should be attached to the contract at Part III, Section J.

If DGPS is to be integrated with an existing navigation and/or survey system, manuals, drawings, etc. associated with that system should be referenced and attached at Section J. Both hardware and software connections and modifications to the existing system must be detailed if such effort is to be an item of work under this contract.

Section D

Packaging and Marking

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D.1. Preparation for Delivery. The system shall be packaged for shipment in accordance with the supplier's standard commercial practice.

D.2. Packaging and Marking. Packaging shall be accomplished so that the materials will be protected from handling damage. Each package shall contain a transmittal letter or shipping form, in duplicate, listing the materials being transmitted, being properly numbered, dated, and signed. Shipping labels shall be marked as follows:

U.S. Army Engineer District, _____
ATTN: {include office symbol and name}
Contract No. _____
[Street/PO Box] {complete local mailing address}

Section E

Inspection and Acceptance

E.1. Acceptance Test. All equipment and related components obtained under these specifications shall be fully certified prior to contract award as meeting the performance and accuracy in Section C. *[any test previously performed for the Federal Geodetic Control Subcommittee (FGCS) will be acceptable for such certification by the vendor; otherwise the vendor shall be required to demonstrate, at the vendor's expense, the acceptability of the system in the manner prescribed in Paragraph E.2. If the FGCS test is to be used in lieu of a demonstration acceptance test, all results from the FGCS test shall be supplied to the contracting officer for evaluation by technical personnel.]

E.2. Final Acceptance Test. At the option of the Government, a final acceptance test will be performed to demonstrate total system conformance with the technical specifications and requirements in Section C.

E.2.1. The acceptance test will be conducted with the system operating in *[static] *[dynamic] *[both static and dynamic] mode(s).

E.2.2. The DGPS positional accuracy will be tested against the accuracy and ranges specified in Paragraph C.1. of this solicitation. The resultant DGPS accuracy will be evaluated with the 2 DRMS error statistic. Inaccuracies in the comparative testing network / system will be properly allowed for in assessing the test results.

E.2.3. The data link system will be tested over the operating distance specified in Section C.

E.2.4. Final acceptance testing will be performed at *[the point of delivery indicated in Section D] *[_], and will be performed within *[_] days after delivery. The supplier will be notified of the results within *[_] days after delivery. If the equipment fails to meet the acceptance test(s), the supplier will be given *[_] days after notification thereof to make any modification(s) necessary to enable retesting. The supplier will be notified of the place, date, and time of testing and, at his/her option, may send a representative to attend such tests.

E.2.5. If after a second test, the system fails to perform in accordance with the technical specifications, the Government will *[_]. {Reference applicable contract clauses/provisions}.

NOTE: The applicable contract clause and provisions must be referenced here.

E.3. Warranty Provisions. For 1 year after delivery by the vendor, all equipment failures, other than those due to abuse, shall be corrected free of charge. Equipment shall be repaired within 5 working days of receipt at the repair facility, or loaner equipment will be provided at no expense to the Government until repairs are completed and the equipment has been returned to the District. The cost of shipping equipment to the vendor for repair shall be paid by the Government while the vendor will pay for returning the equipment to the District.

Section F

Deliveries or Performance

F.1. Delivery and final acceptance of all equipment shall be made within * days after contract award. Delivery shall be made at the USACE facilities at the address identified in Paragraph D.2. of this solicitation. Final acceptance will depend upon all equipment meeting all requirements specified in this contract.

F.2. The contractor shall deliver all material and articles for shipment in a manner that will ensure arrival at the specified delivery point in satisfactory condition and that will be acceptable to carriers at lowest rates. The contractor shall be responsible for and repair any and all damage until the equipment is delivered to the Government.

Section G

Contract Administration Data

Section H

Special Contract Requirements

Part II - Contract Clauses

Section I - Contract Clauses

Part III - Contract Clauses

Section J - List of Documents, Exhibits, and Other Attachments

Part IV - Representations and Instructions

Section K - Representations, Certifications, and Other Statements of Bidders

Section L - Instructions, Conditions, and Notices to Bidders

NOTE: Add applicable contract clauses and provisions to the above parts/sections as required by the FAR and other supplemental regulations.

Part IV - Representations and Instructions

Section M - Evaluation Factors for Award

NOTE: The following clauses would be used if the solicitation requires an evaluation of proposals for award. See the introduction to this guide for the necessity of a formal proposal evaluation.

M.1. Price Basis. Bidders are advised that all bids are solicited on a firm fixed-price basis, and bids submitted on any other than a fixed-price basis will be rejected. Bids submitted on a basis other than free on board (FOB) destination will be rejected.

M.2. Evaluation Criteria.

M.2.1. Technical Factors. The technical part of the proposal shall clearly and fully describe the system to be furnished. Descriptive literature, manuals, and/or reports supplied by the Offeror will be the basis of the evaluation. They should clearly address all items found in the specifications. It is imperative that the Offeror respond to all items in the specifications in like language so the evaluation will compare all products from a common standard. Simple statements such as "conform," which indicate understanding of the requirements, are not adequate. Similarly, phrases which imply or state that the product meets or exceeds the specifications without providing adequate data for the evaluators to make comparisons with those specifications are not adequate.

M.2.2. Pricing Factors. The Offeror shall submit a lump-sum, firm, fixed price in accordance with Part I, The Schedule, Section B.

M.2.3. Preliminary Assessment Procedure. A preliminary assessment will be performed to determine if the Offeror's proposal is acceptable or can be made acceptable without major modification. (The basis for this assessment will be the descriptive literature as called for in Paragraph M.2.1. It is important that this literature be complete, clear, and concise.)

M.2.4. Evaluation Procedure. The evaluation will be based on the Offeror's compliance with a set of technical requirements consisting of the following items:

(1) System Operational Characteristics and Capacities. This includes; but is not limited to; accuracy, number of independent channels, data link system performance, ease of operation, and versatility.

(2) System Physical Characteristics and Capacities. This includes; but is not limited to; weight, energy requirements, ease of use, and protection from the environment.

(3) *[Post Processing Software] *[and] Field Planning Software. This includes; but is not limited to; adequacy of software for the specified task, ease of use, documentation, versatility, graphics capabilities, and support.

(4) Warranty, support services, and miscellaneous items.

(5) Proposals will be evaluated on the factors listed above by having assigned values that contribute to a total score. Baseline values will be established by the criteria found in the specifications. Weighting of the scores is in descending order of the above factors, with the most important listed at the top and the least important listed last. A technical team will evaluate each technical proposal and assign a point score. For those proposals that do not meet a pre-established minimum score as submitted, but that the Government decides could be made acceptable by the submission of more information, technical discussions may be conducted to obtain clarification or enhancement of any such proposals. After these discussions, a final point score will be assigned to each proposal by the team.

M.2.5. Proposal Completeness. Failure to submit all required information will result in the proposal not being evaluated.

M.2.6. Number of Technical and Price Proposals. *[One] technical and *[one] cost proposal(s) shall be submitted by each Offeror.

M.2.7. Final Acceptance Test. The system (equipment and/or software) may be required to undergo a final field acceptance test as described in Section E of this contract. Final award shall be contingent on this acceptance test.

M.3. Award Procedures.

M.3.1. The Government will select for contract award the best overall proposal whose final offer is the most advantageous to the Government considering the price and the technical factors included in the solicitation.

M.3.2. The Government may award a contract on the basis of initial offers received, without discussions. Therefore, each initial offer should contain the Offeror's best terms from a cost or price and technical standpoint.

M.4. Suggested Proposal Submittal Requirements.

NOTE: Select the appropriate items/options that should be provided by bidders to determine their capability in providing an adequate real-time positioning system.

These items should be tailored to specific system requirements.

M.4.1 GPS Receivers.

Positional accuracy of system.

Signal levels .

Operation without cryptographic keys.

Observables.

Measurement time tags.

Code phase signals and accuracy.

Receiver output.

Receiver data rate.

PPS output.

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- Internal receiver testing.
- Reinitialization.
- Multiple satellite tracking.
- Operating conditions.
 - 5 deg SV acquisition.
 - Humidity range.
 - Temperature range.
 - Waterproof.
 - Corrosion resistance.
- Power requirements.
 - Surge protection.
 - Power transfer from AC to DC and reverse.
 - Low power warning.
 - External power source.
 - Battery pack.
 - Charge/recharge capacity.
 - Battery connections/cables.
- Antenna.
 - 5/8-in. by 11-in. mounting.
 - Phase center stability.
 - Cable length and quantity.
 - Frequency reception.
 - Environmental considerations.
 - Waterproof.
 - Antenna pole.
 - Tribrach.
 - Vehicle mount.
- Manuals.
- Field planning software.
- Dimensions.
- Weight.
- RTCM output.
- RTCM input.
- Position update rate.
- Velocity output.
- Ports.
- NMEA 0183 data string.

M.4.2. Data Link.

- Functional itegration.
- 1 percent data loss.
- Transmit/receive frequency.
- Transmit/receive power.
- Baud rate.
- Prescription fee.
- Service fee.
- Antenna mounting.
- Cables.
- Power supply.

M.4.3. Receiver Controller.

- Software/hardware compatibility.
- DOS operating system.
- Processor chip.
- Clock speed.
- Hard drive capacity and access speed.
- Random access memory.
- 3.5-in. disk drive.
- VGA graphics adapter.
- Monitor.
- Ports.
- Power source.
- Environment.

M.4.4. Software.

- Compatibility with receivers and microcomputers.
- Differential code phase processing, post mission.
- Receiver control settings.
- Field mission planning.

M.4.5. Training.

- At delivery.
- At future date.

M.4.6. Miscellaneous Requirements.

- Cables, etc.
- Shipping containers.
- Survey planning software.
- Hardware and software updates.
- Maintenance and repair.